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GAS ABSTRACTS

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1. GAS INDUSTRY

Civil Defense

Marschall, W. N. CIVIL DEFENSE IN THE GAS INDUSTRY. *Gas World* (British), 139, 1537-46 (1954) June 5.

A program of what should be done now (in Britain) to prepare for tomorrow in case of another war. Covers only ordinary type bombs of WW II vintage and mentions briefly the atomic weapons. This service is recognized in Britain as the 14th army of defense along with army, navy and air. R. R. Amrine

Energy Resources

FUEL STUDIES STARTED. *Oil Gas J.*, 53, 70, 71 (1954) August 9.

The President has appointed a Cabinet committee on energy supplies and resources to study the U.S. resources in coal, lignite, coke, coal tars, synthetic liquid fuels, petroleum and natural gas. The impetus behind this move is the coal industry's loss of markets to the natural gas industry. The Senate also has appointed an investigating committee. The major targets of the coal industry are reduction of imports of foreign residual oil, and stopping the spreading industrial use of natural gas.

B. E. Eakin

Las Vegas Supply

IN LAS VEGAS NATURAL GAS IS A "SURE THING". *Gas*, 30, 109-12, 114, 116, 117 (1954) September.

The area around Las Vegas, Nev. has growing industrial, commercial, and domestic development that has been fuel-hungry because of the failure of the government-financed Hoover dam project to produce electricity in quantities consistent with the demands of that and other areas. A pipeline constructed to alleviate this condition by the delivery of low-cost energy from natural gas is designed to deliver about one-third of the total generating capacity of Hoover dam, on an energy equivalent basis. The article describes in detail the market in that area resulting from heavy industry, electric power generation, and domestic and commercial loads. Distribution companies in the vicinity expect to double the number of connected consumers, with LPG systems being replaced by natural gas, at reduced gas rates.

Pipe with reduced wall thickness but having high yield and tensile strengths produced a considerable saving in steel. The pipe was mill-tested to a minimum of 1250 psig. The line is completely electric welded to API standards. Restrictions were placed on the use of cold bending. Several other unique techniques were used in the line's construction. Considerable standardization of components was made and will reduce the expenses of inventory and routine maintenance.

The distribution facilities that supplied LPG to Las Vegas were purchased by a corporation formed for this purpose. The new company will invest about $1.5 million to bring the distribution system abreast of the market by 1957.

Publisher's Abstract

Nationalized Gas Report

Gas Council (Britain) FIFTH YEAR GAS COUNCIL REPORT. *Gas J.* (British), 280, 113-16 (1954) October 13; *Gas World* (British) 140, 936-47 (1954) October 16; *Gas Times* (British) 81, 130, 132, 134 (1954) October 15.

A net surplus of £ 2,111,536 is reported on a gross income of £ 297,424,121 by the twelve area gas boards, of which nine had surpluses and three had deficiencies. This resulted from the sale of 2,513.2 million therms of gas, with credit for sale of by-products, a decrease of 0.4% since last years report. Manufacturing capacity was increased to 11.55 million therms per day (1.4%) to serve the 12,474,818 customers. The precarious supply and high cost of gas-making coals has intensified the research on other gas making materials, and the exploration for natural gas. O. P. Brysch

Northwest Gas

WASHINGTON AWAITS NATURAL GAS. *Gas* 30, 37-41 (1954) September.

The problems of the manufactured gas distributors in the Pacific Northwest are discussed to explain the great demand for natural gas felt in that area since the initial planning stage in 1947. Some of the competitive action between Pacific Northwest Pipeline Corp. and Westcoast Transmission Co. before the Federal Power

Commission is given. Pacific Northwest, as holder of an FPC certificate of convenience and necessity, is described in detail—their financing, potential market, reserves, and their transmission line. The economic picture in relation to fuel supply for the Northwest area is studied from the historical and current views. The operations and proposed expansion of several of the distribution companies in the area are presented. Publisher's Abstract

Public Relations

McDowell, R. WHAT YOUR PUBLIC DOESN'T KNOW IS BOUND TO HURT YOU. *Am. Gas Assoc. Monthly*, 36, 14-16, 47-48 (1954) October. *Canad. Gas J.*, 47, 20-22 (1954) October.

Six basic problems of gas industry public relations are discussed. Lack of public relations, insufficient employee indoctrination, customer dissatisfaction, poor understanding of basic economic requirements of the industry by public and government bodies, poor understanding of industry by opinion-forming business groups and poor education of youth on the modernity of gas service all contribute to bad public opinion. A plan of attack to correct the situation is presented. R. T. Ellington

Rate Regulation

McDugald, C. C. IMPORTANT DEVELOPMENTS RELATING TO THE GAS INDUSTRY. *Public Utilities Fortn.* 54, 406-408. (1954). September 30.

A brief review of the recent decision of the Supreme Court to place natural gas producers under the regulations of the Federal Power Commission. The FPC then granted a new basis of rate making to the Panhandle Eastern Pipe Line Co. in a so-called test case under the new powers of the FPC. The Panhandle case represents a new approach to rate making for the industry and is more liberal than was anticipated. W. G. Bair

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Coumbe, A. T. SALES OF LP-GAS RISE. p. 217

2. APPLIANCES

Air Conditioning

AIR CONDITIONED VILLAGE IS BORN. *Gas Age*, 114, 38-39 (1954) August 12.

A group of 22 houses, known as the Air Conditioned Research Village, were constructed in Austin, Texas. These homes include a wide variety of styles and constructional materials for single-story homes. Investigations of operating costs and effect on family health will be made for air conditioning in these homes.
E. F. Searight

Baseboard Heating

Kruse, B. RADIANT BASEBOARD HEATING BEATS THE COMPETITION FOR THIS PORTLAND DEALER. *Butane-Propane News*, 16, 42-43 (1954) September.

Due to the demand for central heating, the sales of floor furnaces, circulators, and wall heaters for new homes has greatly decreased in this area. Much of the space heating is being supplied by electric competition since cheap electricity from government power projects is available. Radiant baseboard hot water heating is one form of heating in which gas has sufficient advantages to be competitive in this area. The system is also simple enough so that the gas dealer can handle the complete installation.
E. F. Searight

Burners

Corseglia, J. (assignor to Surface Combustion Corp.) GAS CONVERSION BURNER. U. S. 2,685,333 (1954) August 3.

Martt, E. C. (assignor to General Electric Co.) GAS BURNER. U. S. 2,685,916 (1954) August 10.

Ponstingl, F. GAS BURNER. U. S. 2,691,414 (1954) October 12.

Shelton, I. J. GAS BURNER HEAD WITH INTERNAL FUEL HEATER AND DISTRIBUTOR. U. S. 2,686,563 (1954) August 17.

Controls and Ignition

Bydalek, F. J. (assignor to Milwaukee Gas Specialty Co. ACTUATING MECHANISM

FOR ELECTROMAGNETIC CONTROL DEVICES. U. S. 2,687,274 (1954) August 24.

Huff, N. M. (assignor to Harper-Wyman Co.) HANDLE OPERATED LOCKING TYPE GAS VALVE. U. S. 2,687,275 (1954) August 24.

Maurice, G. (assignor to Milwaukee Gas Specialty Co.) BURNER CONTROL APPARATUS WITH SAFETY CONTROL MEANS. U. S. 2,687,169 (1954) August 24.

Penn, P. O., Penn, R. S. and Schell, P. (assignors to Penn Controls, Inc.) MODULATING GAS HEATING CONTROL. U. S. 2,685,411 (1954) August 3.

Rice, H. W. (assignor to Robertshaw-Fulton Controls Co.) CONTROL APPARATUS FOR FUEL BURNING APPLIANCES. U. S. 2,690,189 (1954) September 28.

Schell, P. (assignor to Penn Controls, Inc.) MODULATING GAS HEATING CONTROL. U. S. 2,685,412 (1954) August 3.

Thornbery, J. H. (assignor to Milwaukee Gas Specialty Co.) COMBINED CONTROL AND SAFETY SHUTOFF VALVE. U. S. 2,687,738 (1954) August 31.

Walters, W. B. AUTOMATIC FUEL GAS CONTROL VALVE AND REGULATOR. U. S. 2,690,759 (1954) October 5.

Wittmann, R. A. SAFETY CONTROL SYSTEM FOR GAS BURNERS EMPLOYING SINGLE POINT IGNITION. U. S. 2,688,364 (1954) September 7.

Gas Heating Data

REVISIONS CHANGE ESTIMATES OF GAS HEATING BY STATES. *Gas Heat*, 5, 30-31 (1954) October.

Bureau of Census data and GAMA and AGA statistics are combined to give revised and more accurate figures on the furnace and boiler units and conversion burners now installed in the various state. R. T. Ellington

Pressure Regulator

Hughes, G. C. (assignor to Reynolds Gas Regulator Co.) FLUID PRESSURE REGULATING SYSTEM. U. S. 2,690,760 (1954) October 5.

Refrigeration

Backstrom, S. M. (assigned to Aktiebolaget Elektrolux) ABSORPTION REFRIGERATION SYSTEM. U. S. 2,690,059 (1954) September 28.

This patent relates to an absorption refrigeration system employing an inert gas with a plurality of evaporators and a secondary heat transfer system enabling maintenance of several cooling elements operated at different temperatures of the order of −10° C. and −25° C.
J. F. Reed

Neumann, E. P. et al. (assigned to Ultrasonic Corporation) JET PUMP REFRIGERATION SYSTEM. U.S. 2,688,851 (1954) September 14.

A completely sealed self-contained jet pump system using immiscible liquids is described. It would appear that direct gas firing would be possible. R. T. Ellington

Water Heating

Blendermann, L. PIPING AND PLUMBING SERVICE HOT WATER FOR SCHOOLS. *Heating and Ventilating*, 51, 106-7 (1954) June.

Design factors concerning service hot water for schools and an illustrative method of supplying hot water during the summer months by means of adding a heater to the system which is used during the winter months for supplying the heat and hot water. S. Volchko

Ross, E. S., Taube, K. and Greene, D. S. HOME WASHING MACHINES OPERATING CHARACTERISTICS AND FACTORS AFFECTING PERFORMANCE. U. S. Dept. Agriculture Techn. Bull. No. 1088 (1954) July.

This study shows that the majority of modern automatic washers use at least twenty gallons of hot water per load. These tests show that at least 140° water is advisable and that 160° water does the best job. All of which shows that fast recovery storage-type gas water heaters are the only ones which will permit the modern washer to do its job best.
R. T. Ellington

Johnson, R. C. (assignor to Anthracite Equipment Corp.) COMBINATION WATER AND WARM AIR HEATING SYSTEM. U. S. 2,689,560 (1954) September 21.

3. COMBUSTION AND INDUSTRIAL FURNACES

Combustion Control

Uhl, W. C. COMBUSTION CONTROL=LESS FUEL. *Petroleum Processing*, 9, 1200-02 (1954) August.

The combustion efficiency program of a large oil refinery has resulted in an annual savings in fuel costs of $33,000 for the entire plant. Installation of continuous oxygen analyzers is one of the factors responsible for the success of the program. Principle of operation of the instrument is described. D. J. Dennison

Gas-Fired Ceramics

Cunningham, B. GAS FUELS THE FAST-GROWING LIGHTWEIGHT AGGREGATE INDUSTRY IN THE SOUTHWEST. *Gas*, 30, 57-59 (1954) September.

Lightweight aggregate made from clay or shale subjected to intense heat in processing is materially reducing building construction costs due, in part, to the availability of low-cost natural gas in the Southwest. The material so produced is said to be as strong as concrete, yet is 40% lighter. The use of the material in the construction of a hotel of major proportions is given along with some data. The physical plant of the producer is described. Basically, shale is mined adjacent to the manufacturing plant, processed in natural gas fired kilns, crushed and graded for size, and made into lightweight blocks or other structural shapes. This operation is carried out on a production line; the various steps on the line are described.

Publisher's Abstract

Ventilation Hoods

Hemeon, W. C. EXHAUST FOR HOT PROCESSES. *Heating and Ventilating*, 51, 83-90 (1954) August.

Design considerations for canopy and exhaust enclosures for hot processes are discussed. The difference in conditions encountered for hoods over cold and hot processes, the effect of distance between the hot surface and canopy, lateral exhaust for hot processes, and enclosures for hot processes are taken up, and recommended design procedures are presented.

R. T. Ellington

Waste Gas Heat Recovery

Ardern, D. B., and Lassiat, R. C. DISPOSAL OF REFINERY WASTE GASES. *Petroleum Eng.*, 26, C7-10 (1954) August.

Techniques of heat recovery from the combustion of catalytic cracking-unit flue gases is discussed. A new combustion catalyst, consisting essentially of a 0.003-in layer of platinum-alumina alloy on porcelain rods, has proven efficient and durable, especially for igniting low concentrations of CO and hydrocarbon vapors.

A. J. Tulis

Ruff, R. J. PROFITABLE USE OF EXHAUST FUME. *Ind. Heating*, 21, 1583-84, 86, 88, 90, 92, 1660, 62, 64 (1954) August.

The recovery of energy from fumes and odors by low-temperature catalytic combustion is discussed. R. E. Ellington

4. CARBONIZATION AND GASIFICATION

Coal Gasification

Dent, F. J. TOWN GAS PRODUCTION BY GASIFICATION PROCESSES. *Gas World* (British), 140, 622-24 (1954) September.

Pressure gasification of coal is discussed as the most promising process for increasing the production of gas from coal. The process is generally not limited to special coals as required in coal carbonization and results in complete coal gasification by initial thermal decomposition followed by the reaction of residual carbon with steam. Based on the present status of pressure gasification, an outline for the full development of the process is presented. E. J. Pyrcioch

Mansell, D. J. COMPLETE GASIFICATION IN SCOTLAND. *Coke and Gas* (British), 16, 343-350 (1954) September.

Complete gasification has been maintained on a relatively large scale in Scotland using noncaking and poorly coking coals which are available at an economical price. A typical plant for conducting complete gasification consists of a water-gas generator which has a set of vertical carbonizing retorts built-in at the top, followed

by a conventional carburetor, superheater, waste heat boiler, wash box and other auxiliaries. A flow diagram and operating results are included. C. G. von Fredersdorff

Coal Pyrolysis

Prien, C. H. PYROLYSIS OF COAL AND SHALE. *Ind. Eng. Chem.*, **46**, 1881-1888 (1954) September.

The activation energies for coal pyrolysis are of the same order of magnitude as those for carbon-carbon fission and for separation of macromolecules. Low-temperature carbonization rates are a function of degree of volatilization of oxygen and sulfur compounds, and approach zero-order. Low specific surface area is only incidental to coke formation. Recent German studies suggest petrographic analysis as a control in coal blending. Revision of the single shatter test for coke is desirable. Further alkaline oxidation studies confirm the absence of any aromatic structures in Colorado oil shales. Only 30% of this shale organic matter is solubilized on dehydrogenation. A process for separating kerogen by use of bacteria at 20° to 75° C. has been patented. Also patented is the use of superheated water at 700° F. and 200 atmospheres for extraction of kerogen.

Author's Abstract

Electrocarbonization

Chesley, T. C., Forrester, J. D. and Sarapuu, E. UNDERGROUND ELECTROCARBONIZATION OF COAL AND RELATED HYDROCARBONS. *Mining Eng.*, **6**, (*AIME Trans.*) 908-15 (1954) September.

Underground electrocarbonization of coal, oil shales and bituminous sands is discussed as a means of increasing the future supply of gaseous and liquid fuels. This term includes the processes of electrolinking, and subsequent carbonization and gasification in situ, between steel pipe electrodes drilled preferably into seams not now economically recoverable, using sufficient electric current to break down the electrical resistance of the coal. The steel pipes serve as inlets for the gasification air or steam and outlets for gas and vapors. Results of the tests on coal at Hume, Mo. and Gorgas, Ala. are discussed in respect to economics of power generation by gas turbines. Preliminary results on oil shales are reviewed, and the use of the process as a tertiary method of oil field exploitation would appear promising. O. P. Brysch

Gas Coal Supply

Poulson, C. A. DEVELOPMENTS IN DISTILLATION OF SCOTTISH COALS. *Gas World* (British), **140**, 817-25 (1954) October 2 (1954); 870-74 (1954) October 9; *Gas J.* (British) **279**, 792, 794, 797, September 29; **280**, 44, 47-50 (1954) October 6; 122, 123, 125-27, October 13; *Gas Times* (British), 81, 59-61 (1954) October 1.

The production of 200 million therms annually by the Scottish gas works will require more efficient retort operation in the face of a decreasing supply of local coking coals. New deep mining in Lanarkshire coal fields would provide these high quality coals for the gas industry, and offset the weakly-coking and higher inert coals now available, since the sale of coke dominates the gas balance sheet. Best thermal output in gas per retort, when steaming to produce a gas of 500, 475, 450, 425 and 400 Btu/CF, indicates that 400 Btu gas is cheapest with Lanarkshire coals. Poorer coals (lower gas yields) would favor a 425 Btu gas. Without waste-heat utilization the thermal efficiency of the vertical retort is appreciably reduced. Test results with the carrier-gas technique on 3 Scottish coals show that the gas output may be doubled without enlarging the plant, thus giving great flexibility. However, the thermal balance favors the steaming process for these reactive coals, depending on blue gas and heating cost, and will handle smaller and inferior coals. A radiant-heated devolatilizing process, with subsequent briquetting and secondary coking for weakly-swelling coals, is announced.

O. P. Brysch

Gas Producer

Schutte, A. H. (assigned to The Lummus Co.) GAS PRODUCER. U. S. 2,690,384 (1954) September 28.

Water gas is produced by contacting steam with a continuously circulating bed of coke particles at elevated temperatures in a reactor, with provision for contacting the coke particles at a lower temperature with heavy oil for oil-gas production. E. J. Pyrcioch

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black

Sweitzer, C. W. (assigned to Columbian Carbon Co.) CARBON BLACK. U. S. 2,680,061 (1954) June 1.

The invention relates to the manufacture of furnace blacks and provides improvements in the furnace-black processes of the type in which hydrocarbon is thermally decomposed by rapidly and uniformly mixing it with a hot gaseous medium at a temperature in excess of that at which the hydrocarbon is decomposed to carbon black. J. G. Chalcraft

CO_2 Removal

Vaughan, A. L. and McLaughlin, R. B. NEW PLANT LICKS PIPELINE GAS PROBLEM. *Oil Gas J.*, 53, 180, 254 (1954) September 20.

A brief description of Permian Basin Pipeline Company's natural gas processing plant designed to remove up to 9.8 MMFC of CO_2 per day from natural gas of 30% CO_2 content.
R. F. Bukacek

Communications

Buechner, R. H. HOW TRANSCO MAINTAINS 1,780 MILES OF MICROWAVE. *Oil Gas J.*, 53, 176-177, 260 (1954) September 20.

The main system as installed operates in the 2000 megacycle band, and is provided for pulse-time multiplexing to give up to 12 voice channels. Spur circuits operate on the 950 mc. band. The selection of personnel, both operation and maintenance, has been found to be very important to the performance of the system. Maintenance districts arebroken down into 15 separate 120-mile lengths. Most districts contain one or two stations with multiplexing equipment, two or three repeater stations, and 12 or more two-way mobile radio units. Tube selection is of considerable importance. With 8000 tubes in this system, and an average life of 6 months, tube failures should be at the rate of 2 on hour. Planned preventative maintenance programs can reduce tube failure to a fraction of this figure. The use of ruggedized tubes is certainly justified, as they have a failure rate approximately 1/12 as great as the standard tubes, according to limited tests run so far. Stand-by power supplies are a continuing problem, as dust and high temperatures, combined with intermittant operation, tend to cause excessive failures and mal-function. B. E. Eakin

Compressor Bearings

Greco, E. C. CORROSION OF BRONZE OIL-SEALING SLEEVES IN CENTRIFUGAL GAS COMPRESSORS. *Corrosion*, 10, 279-283 (1954) September.

Pipe line dust was suspected as the reason for the frequent failure of phosphor bronze oil-sealing sleeves in centrifugal gas compressors when analyses of oil from the sealing systems showed appreciable quantities of iron sulfide. This was picked up, along with iron oxide and silica, from pipe line dust created by the passage through the line of steel wire-brush scrapers. Corrosion products resulting from the attack by this dust clogged up oil passages and caused failure of the sleeves. Laboratory tests with oil from the seal oil system were made with copper strips. These tests indicated the dusts picked up by the oils were responsible for the corrosion. Tests with both seal oil and scrubber oils on mild steel, aluminum, Monel, Inconel and nickel showed these suffered no attack. A cellulose-type filter was substituted for the previously used Fuller's earth filter in the seal oil system and after 7 months' observation was found to be substantially more efficient than the Fuller's earth. Meehanite oil seal rings were substituted for the phosphor bronze sleeves and the failures due to iron sulfides were eliminated.
Author's Abstract

Condensate Removal

Hachmuth, K. H. and Jones, E. L. (assigned to Phillips Petroleum Co.) PROCESS FOR REMOVING VAPORS FROM GASES. U. S. 2,688,853 (1954) September 14.

Apparatus and techniques for the removal of condensable vapors from a gas are described. The process utilizes "pebble" heat exchangers, whereby a flowing solid material is used as the heat transfer medium by direct contact with the gas. A fractionation zone is used to effect

the separation of components; impurities in the form of condensable vapors having been removed in the pebble exchangers. B. E. Eakin

Cycling Plant

Enright, R. J. WORLD'S FIRST CYCLING PLANT: STILL GOING STRONG. *Oil Gas J.*, 53, 69-70 (1954) September 6.

The Chicago Corporation's Wardner installation, first placed on stream in December, 1938, is still going strong, and expected to operate at present level for the next 20 years. The initial plant was designed to handle 50 MMCF of gas daily and produce 800 bbls. of liquids. Today the facilities will handle 165 MMCF and produce about 3000 bbls. of liquid per day. The plant is now serving about 50 wells, compared to the initial eight. The reservoir produces from the Stratton-Agna Dulee, which has more than 40 different producing formations, and the plant is designed for intake pressure of 1100 psi; lower pressure wells being compressed in the field, and higher, producing through choke. B. E. Eakin

Distribution

Snyder, E. I. TEN QUESTIONS ON DISTRIBUTION MAINTENANCE. *Gas*, 30, 31-35 (1954) July.

A maintenance program for a distribution system should accomplish three basic objectives: it should result in the elimination of hazardous or potentially hazardous condition; it should keep gas losses to a minimum, and it should ensure the perpetuation of the distribution system by providing for its continuing availability as a safe and efficient means of distributing gas. With these requirements in mind, some of the questions concerning distribution which executives should ask periodically about their own programs, are: what are the maintenance requirements of the distribution system; what schedule of major maintenance should be undertaken; are the special maintenance problems presented by services recognized, are the best surveys for system condition being used; is hazard control receiving attention; do the reports and records used facilitate administration; are the employees familiar with the objectives and basic concepts of the program; are there new maintenance techniques or procedures which should be considered; and, is the distribution maintenance program abreast of current financial conditions? These questions and associated ones are discussed and their importance to the maintenance of a system is emphasized. B. E. Eakin

District Pressure Control

"PACKAGED" DISTRICT REGULATOR DEVISED BY DALLAS ENGINEERS. *Gas*, 30, 70 (1954) September.

A natural gas distributor has devised a shop-built utilization pressure district regulator station that can be installed on the job in less than three hours. The design of an older station was modified to permit convenient installation in a pit. The station is cased by a ¼-in. welded steel box fitted with a double-hinged lid made from tread-plate steel. This unit can be installed in parkway space between curbs and sidewalks. Many of the construction and design details are included in the article. Publisher's Abstract

Domestic Meters

Gilmore, E. CAN A DOMESTIC GAS METER'S ACCURACY BE IMPROVED? *Gas*, 30, 42-44 (1954) September.

Methods of making a survey to determine the condition of incoming and outgoing meters are outlined. Two very useful charts for plotting results obtained from individual meters are shown. With these two charts, a trained meter-shop man should be able to determine if the bulk of the meters serviced are delivered accurately within limits that call for no corrective program, or if a general study is needed or imperative. Also, for those meters that fall outside of the acceptable limits, a number of check points are listed. Publisher's Abstract

Ethane for Peak Load

Howard, F. A. (Assignor to Standard Oil Development Co.) SEGREGATION AND PEAK LOAD USE OF ETHANE IN NATURAL GAS. U. S. 2,688,534 (1954) Sept. 7.

A system is outlined whereby the constituents less volatile than methane will be removed from a dry transmission gas at the point of consumption during periods of low demand, separated under high pressure by use of solid adsorbents,

stored, and used to supply periods of high demand. Methane normally would be distributed, and the ethane and heavier revaporized and added to the supply during high demand periods.

B. E. Eakin

Gas Dehydration

Campbell, J. M. METHODS FOR GAS DEHYDRATION FOR 1954. *Petroleum Eng.* 26, C11, C14, C16 (1954) September.

A discussion of current trends in gas dehydration which includes an extensive bibliography.

R. F. Bukacek

H_2S Removal

Hawkes, C. T. (assigned to Humphreys and Glasgow Ltd.) GAS PURIFICATION. U. S. 2,689,164 (1954) September 14.

This patent relates to a process for removal of H_2S from gases by washing in a series of washers with an aqueous alkaline suspension of hydrated oxide of iron, or carbonate or basic carbonate of iron which is regenerated by passage of oxygen or air through it. Used suspension from washing stages late in the series may be used for washing earlier in the series, where the concentration of H_2S is higher. It is claimed that washing is more effective with used suspension from a later stage than the immediately following one. D. M. Mason

Updegraff, N. C. THE OUTLOOK FOR SULFUR. *Petroleum Processing*, 9, 1404-1406 (1954) September.

The process for recovery of elemental sulfur from H_2S-bearing gases is discussed briefly with a description of the process, and discussion of the present status as to capacity and economics and future outlook.

D. M. Mason

Updegraff, N. C., and Reed, R. M. 25 YEARS OF PROGRESS IN GAS PURIFICATION. *Petroleum Eng.*, 26, C57-C58, C60-C63 (1954) September.

Gas purification using ethanolamines is reviewed. The chemistry and flow plan of the process, simultaneous dehydration, and problems due to impurities in the gas, corrosion, and decomposition of solutions, are among the topics discussed. D. M. Mason

Jet Compressors

Warner, C. W. GAS MIXING WITH JET COMPRESSORS. *Gas*, 30, 50-56 (1954) September.

The article reviews the various methods of using the energy of high pressure gas to raise another gas (at relatively low pressure) to some desired intermediate pressure. The design of jet compressors to produce optimum results is then treated at length. Auxiliary devices that influence the jet compressor performance are described. Actual performance data are given; then, some of the limitations are discussed. On the basis of these limitations, jet compressor gas mixing control systems were devised to offset the objections outlined. These control systems are covered in detail, and some of the applications for jet compressors are presented.

Publisher's Abstract

Line Blowdown

Park, T. S., Jr. FIND EXHAUSTING TIME FOR GAS LINE BLOWDOWN. *Pipeline Industry*, 1, 82-84 (1954) September.

Here is a graphical aid for designers who are confronted with the task of determining valve size and exhausting time for blowdown of gas pipe lines. The charts are based on 1000 psia line pressures but are applicable to any other operating pressure. Calculation procedure is outlined in the examples. B. E. Eakin

LP-Gas Storage

Billue, G. H. PRODUCTS GO UNDERGROUND. *Pipe Line Industry*, 1, 66, 67 (1954) September.

A short summary of the status of underground storage facilities for LP-gas is presented by the author, who is associated with an underground storage development company. A listing of the operators, location, capacity and use of the underground storage projects (other than gas) in the United States is also given. J. M. Reid

Doughty, K. V., and Cole, C. M., Jr. STATUS AND PROGRESS OF UNDERGROUND STORAGE. *Petroleum Engineer*, 26, C45, C46, C48, C50 (1954) September.

This article summarizes underground storage, in use today, covering location by state, type of

cavity, present capacity and proposed or ultimate capacity. The essentials necessary to the formation of salt and mined cavities are discussed, together with their economic limitations. Closed structures of permeable formation and abandoned mines and tunnels are briefly discussed. D. J. Dennison

HOW LPG WAS STORED IN A PRODUCING BRINE WELL. *World Oil*, 139, 206 (1954) September.

Butane has been stored successfully in two brine producing wells in Texas. It is stored at the top of the salt cavern allowing salt to be washed out from the bottom with fresh water. The LP-gas is introduced and withdrawn in the annulus between a 7-inch and 9⅝ inch casing which extends to 1193 feet, below the top of the salt at 1004 feet. Recovery of the butane has leveled off at 99.7 percent from an initial 93 percent recovery. E. J. Pyrcioch

LP-Gas in 1953

Coumbe, A. T. and Avery, I. F. SALES OF LP-GAS RISE 10 PERCENT. *Gas Age*, 114, 41-43 (1954) September.

The overall use of LP-gas during 1953 was up 10 percent over the previous year. Consumption increased in all fields except the use by utility gas companies which was off 14 percent. Comprehensive statistics on the use of LP-gas during 1953 and comparative earlier figures are presented in tabular form. J. M. Reid

LP-Gas Safety

Kramer, W. H., Jr. ENGINEERING SAFETY INTO AN LPG PLANT. *Butane-Propane News*, 16, 41-49 (1954) October.

A review of the essential safety features which must be considered in constructing a LPG Plant. Numerous building codes are cited. W. G. Bair

Odorizing Operations

Dormer, George G. INSTALLING AN ODORIZER. *Gas*, 30, 60-66 (1954) September.

An Eastern natural gas distributor begins the design of an odorizer installation with an odor level test made with a commercial device produced for this purpose. These tests determine if the odor level is sufficient to provide adequate warning in case of leakage. In case the introduction of malodorant is required, the next step is to determine the proper location for odorization equipment. The company's decision was to locate odorizers at each major gas-purchase connection. The company's experience with the many types of odorizers, and reasons for the selection of a certain make are discussed. Certain alterations in the design of the odorizer and the operation of this modified odorizer is then discussed. Selection of a malodorant, and the reasons for the selection of a particular one by the author's company are given. Routine odorizer operation and maintenance are reviewed; this covers—periodic reports, differential gauge used, calibration of the storage tank and pump, and test runs. Much in-service operating experience is presented.

Publisher's Abstract

Pipe Line Cleaning

Foulke, G. E. GULF INTERSTATE DEVELOPS AN EFFECTIVE TECHNIQUE FOR HIGH-PRESSURE AIR TESTING AND CLEANING OF IT 850-MILE GAS TRUNKLINE. *Oil Gas J.*, 53, 182, 184, 186, 242-44 (1954) September 20.

A method of testing and cleaning with high-pressure air which proved to be a complete success is presented including the equipment used and the procedure which was followed.

S. Volchko

Pipe Line Flow

Marvin, C. W. GAS-FLOW ANALYZER. *Oil Gas J.*, 53, 152-66 (1954) September 20.

A graphical method for the solution of pipeline flow problems is presented which has much to commend it. The method's application to a number of specific problems, for example, looped systems, is described in detail. R. F. Bukacek

Production

Hughes, J. D. PERFORATING COMPANIES REACH MATURITY. *Oil Gas J.*, 53, 98, 100-02, 105 (1954) September 27.

The story of the development of the gun perforating service is outlined, from the first use in 1932 to the present. The extension of perforating companies by research, both in the laboratory and in the field, and the cooperation between them and the oil companies, is one of

the highlights of the petroleum industry. There were a total of 502 perforating hoists in service at the end of 1952, with a total employment for the industry of 4,896; 178 being employed directly in perforating research and development.

B. E. Eakin

Reservoir Engineering

Matthews, C. S., Brons, F. and Hazebroek, P. A METHOD FOR DETERMINATION OF AVERAGE PRESSURE IN A BOUNDED RESERVOIR. *J. Petroleum Techn.*, **6**, 35-40 (1954) August.

The use of pressure build-up curves to obtain an overall average reservoir pressure to use in the material balance equation is a standard procedure. However, the author believe that the present use of the extrapolated pressure, i. e., the pressure obtained by extrapolating to infinite time the linear portion of the graph of closed-in pressure versus log $\triangle t/ (t + \triangle t)$, where $\triangle t$ is the closed-in time and t is the production time, gives a fictitious pressure. A method is presented for calculating the average pressure in a bounded reservoir, by use of the criterion that a well's drainage volume is proportional to the individual production rate. The average pressure is calculated by applying a correction to the pressure obtained by extrapolation, the correction being a function of the geometry of the drainage volume and the production time. The correction is presented in graphical form for various shapes of the drainage area (horizontal cross section of the drainage volume). An example of the application of the method to a reservoir is given, and the calculations are simply and easily applied when pressure build-up data are available.

B. E. Eakin

Stand-by Gas

UNIQUE LPG STANDBY HOOKUP ASSURES UNINTERRUPTED CHANGEOVER. *Gas*, **30**, 48-49 (1954) September.

This article describes an LP-gas hookup that backs-off a natural gas regulator when standby periods occur at the Solar Aircraft Co., in San Diego, Calif. When standby gas is necessary due to emergency or economic conditions, LP-gas is introduced into the plant's piping at a higher pressure than that of the natural gas normally therein. The high pressure on its upstream side closes the natural gas regulator and up to 75% of the total gas required in the plant is then supplied by the LPG system. The gas supply can be restored to natural gas by merely closing the valve that inlets LPG to the piping. The LPG service equipment in use is mentioned and pictured. The importance of the standby gas system is pointed out by a report of the Solaramic coatings produced at the plant and their value to the aircraft and other industries that have need for materials resistant to high temperatures and corrosion.

Publisher's Abstract

Well Flow Testing

Reschke, A. H. HOW TO MEASURE AN OPEN FLOW. *Amer. Gas Assoc. Monthly*, **36**, 27-28, 44 (1954) September.

A discussion of open flow testing of gas wells which includes the methods of calculation used, precautions to be observed and some of the problems encountered with high pressure wells.

R. F. Bukacek

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Hydrocarbon Pyrolysis

Sterba, M. J., and Haensel, V. PYROLYTIC AND CATALYTIC DECOMPOSITION OF HYDROCARBONS. *Ind. Eng. Chem.*, **46**, 1888-94 (1954) September.

A review of the new literature in the field is presented. Theoretical and commercial aspects of the subject are covered. A good bibliography is included.

W. G. Bair

Hydrogenation

Keely, W. M. HYDROGENATION AND HYDROGENOLYSIS. *Ind. Eng. Chem.*, **46**, 1846-1863 (1954) September.

Interest continued in iron-type catalysts and fluidized processes in the Fischer-Tropsch literature. The addition of thallium and cerium to the usual zinc-copper-chromite-type catalyst was investigated for the methanol synthesis reaction. Studies were made using cobalt hydrocarbonyl for the aldehyde formation step and nickel- or cobalt-type catalysts for the alcohol formation step of the oxo process. The oil and fat hydrogenation literature included selective hydrogenation studies employing nickel or a

promoted nickel catalyst. Proper choice of selective hydrogenation catalysts at given operating conditions allowed the removal of acetylene from gas streams containing ethylene. In the ammonia synthesis field, a comparison between data obtained during a pilot plant run and laboratory data was made. Investigators continued to report hydrodesulfurization and reforming studies of petroleum and petroleum products. High pressure hydrogenation of coal for the production of good grade aromatic-type gasoline was described. Hydrogenations of many different organic compounds were studied under various conditions with the bulk of the work relating to nickel, palladium, platinum, and lithium aluminum hydride catalysts. Mechanisms of catalyst reduction and of exchange and hydrogenation reactions were reported.

Author's Abstract

Middle East Oil

KUWAIT: GAUGES BILLIONTH BARREL AS 1953 OUTPUT REACHES 314,592,486. KUWAIT OIL COMPANY NOW LARGEST PRODUCING FIRM IN WORLD. *World Oil*, 139, 101-02 (1954) August 15.

The small sheikhdom at the head of the Persian Gulf started commercial output in 1946 and has grown from 6 million barrels annually to 314 million barrels last year. Having displaced Saudi Arabia in 1953 as the largest Middle East crude oil producer, it is now showing indications of possibly catching up with Venezuela, the world's second largest petroleum producer. Its average daily production for the first 4 months of 1954 was 883,729 bbls., up 9% over the like 1953 period. Kuwait oil represented 10% of the total 1953 U. S. imports, and will exceed this in 1954. B. A. Eakin

SAUDI ARABIA: EDGED OUT BY KUWAIT IN 1953 AS TOP MIDDLE EAST PRODUCER, COUNTRY IS NOW VYING FOR LEAD POSITION. *World Oil*, 139, 106-108, 113 (1954) August 15.

In May of 1954, the Arabian American Oil Company produced on average of 1,026,000 barrels of petroleum daily, which is a new record for an oil-producing country. During the first 5 months of 1954 the production has averaged 967,057 barrels daily, a 17% increase over the same 1953 period. A large portion of Saudi Arabian crude goes to eastern markets, as evidenced by a decrease in the U. S. imports for the first quarter of 1954. The new tanker pact signed by the King may prove troublesome in future operation. B. E. Eakin

Shale Mining

Payne, J. W. Assignor to Socony-Vacuum Oil Co. PROCESS FOR THERMALLY WORKING OIL SHALE. U. S. Patent 2,688,464 (1954) September.

A method is described for boring a hole in oil shale or other combustible-bearing rock layers, by preheating the surface to the ignition temperature of combustion with an oxy-fuel gas torch, then maintaining the combustion with oxygen alone, removing the rock material as slags, and continuously advancing the oxygen jet. E. B. Shultz

7. ANALYTICAL METHODS AND TESTS

Chromatographic Analysis

McKinney, C. M. and Hopkins, R. L. ALUMINA-ADSORPTION ANALYSIS OF PETROLEUM AROMATICS IN 420° to 600° F. RANGE. *Anal. Chem.*, 26, 1460-65 (1954) September.

The alumina-adsorption method provides a means of partial analysis of aromatic types. The density and refractive index data for aromatic hydrocarbons expected to be present in the boiling range studied can be compared with similar data for the fractions obtained from the alumina-adsorption analysis. Smoke points of these fractions can be correlated with the presence of polycyclic or monocyclic aromatic types. E. Mann

Dust Determination

Gilkinson, R. W. DETERMINING SUSPENDED SOLIDS IN GAS. *Gas Age* 114, 31-34; 64-66. (1954) September.

A continuous sampling and alarm system was developed to check the amount of lampblack present in the product gases from CCR sets. The device utilizes a photo-cell to gage the relative transmission of samples of filter paper placed in a small side stream of the product gas.

If the lampblack increases to an alarming extent the operator can change unit conditions to control this situation. W. G. Bair

Gas Chromatography

Patton, H. W., Lewis, J. S. and Kaye, W. I. THE SEPARATION AND ANALYSIS OF GASES AND VOLATILE LIQUIDS BY GAS CHROMATOGRAPHY. Am. Chem. Soc. Joint Symposium No. 31, Div. Ind. & Eng and Div. Petroleum 25-33. New York (1954) September 11-17.

Satisfactory gas separations can be made on charcoal, silica gel, and alumina columns with hydrogen, nitrogen or carbon dioxide carrier gases. Hydrogen, and methane to C_4 hydrocarobns, can be detected at a concentration of 0.2% and determined with an accuracy of 0.2% in the range 0 to 10%. A thermal conductivity cell can be modified to produce an excellent detector. D. J. Dennison

Hydrogen Determination

Schuhmann, S. and Shepherd, M. DETERMINATION OF HYDROGEN BY SLOW COMBUSTION OVER PLATINUM IN EXCESS OXYGEN. *J. Research Nat. Bur. Standards*, 53, 77-80 (1954) August.

The accuracy and reproducibility of the determination of hydrogen in the absence of other combustibles by combustion with excess oxygen over a hot platinum helix (slow combustion) were experimentally determined. Without correction for gas compressibility, pure hydrogen gave 99.98 ± 0.037 where calculated from the contraction, and 99.91 ± 0.13 where calculated from the oxygen consumed. Corrected, these results became 100.02 ± 0.03 and 100.03 ± 0.13, respectively. D. M. Mason

Thomas, B. W. HYDROGEN MEASUREMENT TECHNIQUES NEED EMPHASIS. *Ind. Eng. Chem.*, 46, 79A-80A, 82A (1954) September.

The thermal conductivity, heat of combustion, and specific gravity of hydrogen versus light gases afford techniques of analysis for hydrogen that are limited or complicated with mixtures other than binary. Analyzers incorporating hydrogen's low molecular weight, diffusivity through certain metals, and high absorptivity for beta rays are discussed. The mass spectrometer affords a nearly specific technique for hydrogen analysis in any mixture.

A. J. Tulis

Infrared Analysis

Connor, R. P. and Ward, W. M. ANALYSIS OF HYDROCARBONS VIA INFRARED SPECTRO-PHOTOMETRIC INSTRUMENTS. *Petroleum Eng., (Ref. Annual)* 26, C40-42, 44-46, 48 (1954) July.

A brief resume is given of infrared spectroscopic problems overcome in the past, what the method can tell about a given sample, and what is being done today. It is directed toward the petroleum industry applications.

R. R. Amrine

Gaunt, J. A SIMPLE INFRA-RED GRATING SPECTROMETER FOR USE IN ANALYSIS. *J. Sci. Instruments* (British), 31, 315-18 (1954) September.

A grating infrared spectrometer designed for the analysis of heavy water (deuterium oxide) is described. Typical analyses, graphs of filters and of several gases are given. The chief advantage of such an instrument is in the grating permanence and its chief disadvantage is in the detector cells used. R. R. Amrine

Towler, J. H. and Holland, B. H. ANALYSIS OF THE UNSATURATED HYDROCARBONS IN FUEL GASES BY INFRARED SPECTROSCOPY. I. ANALYSIS OF A TOWN'S GAS. *J. Appl. Chem.* (British), 4, 517-524 (1954) September.

A method is described by which the unsaturated hydrocarbons are isolated from a gas in two stages; condensable compounds are first removed by refrigeration at −80°; unsaturated hydrocarbons remaining in the gas are then separated as bromine-addition compounds. The two groups of compounds thus obtained are distilled into fractions and the fractions analysed quantitatively by infrared spectroscopy. The method has been applied to the analysis of a town's gas, from which the unsaturated hydrocarbons have been resolved into 37 individual compounds. Authors' Abstract

Nitrogen Determination

Polley, J. R. COLORIMETRIC DETERMINATION OF NITROGEN IN BIOLOGICAL MATERIALS. Anal. Chem. **26**, 1523-24 (1954) September.

The presence of free mercury in the digestion mixture interferes with direct Nesslerization by causing precipitation with the Nessler reagent. In the method described it is proposed to digest the sample, then add zinc dust to remove free mercury by amalgamation, thereby making possible a colorimetric assay of the nitrogen. D. J. Dennison

Nondestructive Testing

Prange, F. A., and Headrick, J. F. NONDESTRUCTIVE TESTING DETECTS CORROSION DAMAGE. Oil Gas J., **53**, 82 (1954) September.

Latest techniques for detecting corrosion damage, including fatigue, stress corrosion, embrittlement, and weld cracking, pitting, and thickness of protective coatings, are surveyed. D. M. Mason

Olefin Determination

Saier, E. L., Pozefsky, A., and Coggeshall, N. D. DETERMINATION OF OLEFIN GROUP TYPES BY CHROMATOGRAPHIC AND INFRARED ABSORPTION TECHNIQUES. *Anal. Chem.*, **26**, 1258-63 (1954) August.

In the spectroscopic determination of functional group types there are fundamental limitations due to variations in position and intensity of functional group absorption. A detailed study has been made of the limitations and applications of the analysis for functional group-type olefins. A high degree of accuracy is not possible, owing to variations in absorption behavior among olefins of the same class, although very useful results may be obtained. A method of working in dilute carbon disulfide solutions with thick cells has been developed to eliminate the dependence on specific absorption cells. Chromatographic procedures were employed to obtain olefin-rich mixtures for direct examination. The procedure has been employed as an integral portion of a complete analysis for certain problems wherein specific paraffins, group-type olefins, and specific aromatics are determined. Authors' Abstract

Petroleum Sulfur

Thompson, C. J., Coleman, H. H., Rall, H. T., and Smith, H. M. SEPARATION OF SULFUR COMPOUNDS FROM PETROLEUM. Amer. Chem. Soc., Divis. of Petroleum and Ind. & Eng. Chem. Joint Symposium No. 31, 35-54, New York, September 11-17, 1954.

Methods used by API Res. Proj. 48 for analytical separation of sulfur compounds from petroleum are described. Chemical methods are found to be limited because in some reactions the original compound is destroyed, but will probably be found useful in the separation of different types of S compounds, after they have been separated from hydrocarbons. Distillation can be used only under limited conditions such that thermal decomposition is avoided. The most effective separation means employed to date has been chromatography on alumina. Thermal diffusion offers advantages for some separations. Using only distillation and alumina adsorption, 43 sulfur compounds have been isolated from fractions of a Wasson, Texas, crude boiling up to 220° C., and have been identified by infrared and mass spectra. D. M. Mason

Shale Oil Analysis

Dinneen, G. J., Smith, J. R., Van Meter, R. A., Albright, C. S., Anthony, W. R. APPLICATION OF SEPARATION TECHNIQUES TO A HIGH-BOILING SHALE-OIL DISTILLATE. Amer. Chem. Soc. Preprint, Joint Symposium No. 31, Div. Ind. & Eng. and Div. Petroleum, pp. 179-184, New York (1954) September 11-17.

A gas oil from Colorado shale oil has been resolved into simpler fractions by the use of modern separation methods. Adsorption with a variety of adsorbents was the principal method used. In addition, vacuum distillation, thermal diffusion and adduct formation were employed. The emphasis was placed on the identification of compound types. Saturated, olefinic and aromatic hydrocarbon, nitrogen, oxygen and sulfur-containing compounds were the fractions first prepared. Then the saturated and olefinic materials were each subdivided into straight and branched-chain concentrates. Aromatics were subdivided into fractions with different numbers of aromatic rings. E. B. Shultz

Sulfur Determination

Keller, R. E., and Munch, R. H. TITRIMETRIC DETERMINATION OF SULFATES BY DIAZO TITRATION OF BENZIDINE SULFATE. Anal. Chem., 26, 1518-19. (1954) September.

Sulfate is determined by precipitation as benzidine sulfate, filtration and resolution of the precipitate, and titration of the benzidine sulfate by a diazotization reaction. Sulfonate samples containing 2-12% of sulfate (20-120 mg) have been analyzed with maximum error of ± 0.8%. D. M. Mason

Wilson, H. N., Pearson, R. M. and Fitzgerald, D. M. IMPROVEMENTS IN THE DETERMINATION OF SMALL AMOUNTS OF SULPHUR. PART I: CATALYST AND APPARATUS. PART II: A VOLUMETRIC DETERMINATION OF LOW CONCENTRATIONS OF SULPHATE ION USING BARIUM ION AND A STANDARD DISODIUM DIHYDROGEN ETHYLENEDIAMINETETRAACETATE SOLUTION. *J. Appl. Chem.* (British), 4, 488-496 (1954) September.

Ceria on alumina, a "universal" catalyst for the quartz-tube method for the combustion of organic compounds, has the advantage of being unaffected by chlorine and thus can be used for the analysis of chlorinated compounds. An improved absorption train using a glass-tubing packed absorption tower is described. The volumetric determination of sulfur concentrations of 0.5 - 10 mg. sulfur/100 ml. requires 30 minutes for completion and gives results of the same order of accuracy as the standard gravimetric procedure. D. J. Dennison

8. GENERAL AND PHYSICAL CHEMISTRY

Fractionation Research

Thornton, D. P., Jr. NON-PROFIT FRACTIONATION RESEARCH. *Petroleum Processing*, 9, 1370-1375 (1954) September.

A nucleus of 42 companies including petroleum and engineering firms recently became stockholders in a non-profit research organization called "Fractionation Research, Inc." The research objective of the organization is to develop the requisite information so that presently operating equipment may be revamped for increased capacity, separating efficiency, or both, and new columns can be designed which will be less expensive, more effective, reliable and flexible than possible with current design knowledge. Organization, research program, and current status of research are discussed in the paper. D. M. Mason

Heats of Adsorption

Schreiber, H. P. and McIntosh, R. SOME THERMODYNAMIC PROPERTIES OF HYDROCARBONS ADSORBED ON RUTILE. *Can. J. Chem.*, 32, 842-857 (1954) September.

By means of the B.E.T. method of obtaining adsorption isotherms and by calorimetry methods, experimental data was obtained for the adsorption of methane, ethane, propane and n-butane. From these data, the isosteric heats of adsorption and entropy were calculated.
S. Mori

H_2S-CH_4 Hydrates

Noaker, L. J., and Katz, D. L. GAS HYDRATES OF HYDROGEN SULFIDE-METHANE MIXTURES. *J. Pet. Tech.*, 9, 135-137. (1954) September.

Experimental data are presented for hydrate formation conditions for mixtures of hydrogen sulfide and methane. Vapor-solid equilibrium constants for hydrogen sulfide are also presented. Equilibrium constants, defined here as the ratio of the mole fraction of hydrogen sulfide in the vapor phase (dry basis) to the mole fraction of hydrogen sulfide in the solid phase (dry basis), were calculated using the vapor-solid equilibrium constants for methane presented in an earlier paper. The conditions at which a natural gas will form gas hydrates with water may be computed from its composition, when hydrogen sulfide is present in addition to carbon dioxide and the paraffin hydrocarbons.
Authors' Abstract

Infrared Spectra

Lamneck, J. H., Jr., Hipsher, H. F., and Fenn, V. O. INFRARED SPECTRA OF 47 DICYCLIC HYDROCARBONS. Nat. Adv. Comm. Aeron. Techn. Note 3154 (1954) June.

The infrared spectra are presented for 47 dicyclic hydrocarbons consisting of some alkyl-

diphenylmethanes, alkyldicyclohexylmethanes, alkylnaphthalenes, alkyltetralins, 1,3-diphenyl-2-alkylpropanes and 1,3-dicyclohexyl-2-alkylpropanes. The physical properties of these highly purified compounds are included for reference purposes. Authors' Abstract

Instrument Application

McMaster, R. C. INSTRUMENTATION FOR INDUSTRIAL RESEARCH. *Ind. Lab.*, 5, 6-12 (1954) September.

A review of applications of modern instruments in industrial research laboratories is presented. D. V. Kniebes

Phase Equilibria

Winn, F. W. EQUILIBRIUM K'S BY NOMOGRAPH. *Petroleum Refiner*, 33, 131-135 (1954) June.

This is the most comprehensive nomograph ever developed for equilibrium K's. The range includes the light hydrocarbons, narrow-cut petroleum fractions, and certain non-hydrocarbons (hydrogen, hydrogen sulfide, and carbon dioxide) from 40 to 800° F. at pressures from 10 to 10,000 psia. The average deviation from experimental data is 6.8 percent. The nomograph can be interpreted directly for all hydrocarbons up to n-heptane, and interpolated for hydrocarbons and fractions with atmospheric boiling temperatures up to 800° F. The interpolation charts are given. The chart is applicable to binary, ternary, or multicomponent systems. B. E. Eakin

9. ORGANIC CHEMISTRY

Acrylonitrile Synthesis

Thornton, D. P., Jr. FROM NATURAL GAS TO ACRYLONITRILE. *Petroleum Processing*. 9, 1589-1591 (1954) October.

The process to be used by American Cyanamid Company for the production of acrylonitrile is described. The starting material, methane, is burned with oxygen to give acetylene, hydrogen, and carbon monoxide. The hydrogen (including that obtained from the reaction of the carbon monoxide with steam) is used in the synthesis of ammonia. The ammonia is then reacted with methane and air to give hydrogen cyanide. Finally, the HCN is added to highly purified acetylene to give acrylonitrile. Details are given for the reaction and purification processes. S. A. Weil

Butane Oxidation

Quon, D., Lana, I. D. and Govier, G. W. THE VAPOR PHASE PARTIAL OXIDATION OF *N*-BUTANE: EFFECT OF PRESSURE, REACTION TIME, AND INLET GAS COMPOSITION. *Can. J. Chem.*, 32, 880-895 (1954) September.

Data are presented on the product yields and the general course of the partial oxidation of n-butane at an ambient temperature of 725° F., at pressures ranging from 50 to 175 psia, reaction times of 1.0 to 4.5 sec, and inlet reactant compositions of 1.5 to 6.0 mole percent n-butane and 1.5 to 6.0 mole percent oxygen (the remainder being diluent nitrogen). Conditions were neither isothermal nor adiabatic and peak temperatures as much as 70° F. higher than the inlet temperatures were encountered. The reactor consisted of a 24-ft length of ¼-in stainless steel pipe, immersed in a bath of boiling Aroclor 1254. Under optimum conditions, a 20 percent conversion of the butane to methanol, ethanol, acetaldehyde, acetone, and formaldehyde was obtained. In all the tests, an induction period of approximately 0.75 sec. was observed. Authors' Abstract

Gas for Chemicals

Fleck, A. ORIGINS AND DEVELOPMENT OF GAS FOR INDUSTRIAL PURPOSES. (MURDOCH MEMORIAL LECTURE). *J. Inst. Fuel* (British); *Gas J.* (British), 280, 110-12 (1954) October 13, 1954; *Gas World* (British); *Gas Times* (British) 81, 178-80 (1954) October 29.

The bicentenary of Murdoch's birth is appropriately commemorated by a review of the early gas industry and of the subsequent developments in gas manufacture. The use of carbonization gases in the chemical industry is emphasized with special reference to byproducts. Development of producer and water gas particularly as a source of ammonia, hydrogen, and carbon monoxide as chemicals, and as raw material for modern catalytic processes yielding methanol, aromatics, olefins, motor fuels, has led to newer gasification processes which utilize non-coking coals. Potentialities of oxygen for coal and oil gasification, and exploration for natural gas in Britain are discussed. O. P. Brysch

Hydrocyanic Acid

Eck, J. C. (assigned to Allied Chemical & Dye Corp.) PRODUCTION OF HYDROCYANIC ACID. U. S. 2,688,531 (1954) September 7.

A non-catalytic heat-regenerative process is proposed for reacting methane and ammonia to form hydrocyanic acid. In this process the reacting mixture, which comprises 1.3-3.0 volumes of methane per volume of ammonia and 2-9 volumes of hydrogen plus nitrogen per volume of ammonia, is heated to above 1200° C. by contacting preheated refractory surfaces at residence times of 0.15-0.3 seconds. The reaction products are scrubbed, yielding an HCN solution, and unreacted gases are recycled, whereupon a portion is burned to preheat the reactor. C. G. von Fredersdorff

Petrochemicals

Reidel, J. C. PETROCHEMICALS TODAY AND TOMORROW. *Oil Gas J.*, 53, 83-98 (1954) September 6.

Natural gas and petroleum constitute a major raw materials source (25%) for chemicals production. A twelve-page survey lists U.S. organic petrochemical Plants, giving the company, location, raw materials used and principal products manufactured. Also listed are U.S. nitrogen chemical manufacturers, butadiene plants, carbon black plants, and Canadian petrochemical plants. E. Mann

PETROCHEMICALS TOMORROW. *Petroleum Processing*, 9, 1384-86 (1954) September.

Through 1955, an average increase in production of 12 percent per year is predicted for the petrochemical industry, which should have a 4 billion dollar plant investment by that year. The long range outlook, gleaned principally from the 1952 report of the indicates that output will continue to grow, but at a slower pace. Oil will tend to become more important as a raw material rather than natural gas. Several processes formerly using natural gas and which have been converted to heavy oil feed, are cited to support this idea. Acetylene from natural gas should come up fast. More oil company petrochemicals will be used by their makers to improve their own petroleum products.

E. B. Shultz

10. CHEMICAL ENGINEERING

Distillation

Teller, A. J. BINARY DISTILLATION. *Chem. Eng.*, 61, 168-183 (1954) September.

This comprehensive review of the principles and techniques of distillation is divided into three major parts. The first part deals with the fundamentals of vapor-liquid relationships of binary mixtures, covering miscible, partially miscible, and immiscible systems, both ideal and non-ideal. The basic theories of column design are then described in the second part, including the methods of McCabe-Thiele, Ponchon-Savarit, Smoker, and Gilliland for continuous fractionators, Rayleigh's analysis of batch distillation, and Bogart's treatment of continuous fractionation. The concepts of HETP and HTU are also discussed. Finally, the design and performance of commercial plate columns and packed towers are briefly summarized in the third part. Pertinent sample calculations are given for the first two parts. S. Hu

Dust Removal

Kane, J. M. GUIDES IN DUST COLLECTOR SELECTION. *Heating and Ventilating*, 51, 77-82 (1954) October.

An understanding of basic data regarding equipment is applied to the selection of the proper type dust collector for a particular industrial process which is dependent upon gas purity. S. Volchko

Miller, H. I., Jr. CONTROLLING URANIUM DUST. *Heating, Piping and Air Conditioning*, 26, 109-113 (1954) September.

Toxic dusts, gases, and mists from the processing of uranium ores are strictly controlled by means of standard equipment and methods in a typical plant operated for the Atomic Energy Commission. Any operation, whenever possible, is isolated to protect the workers from harmful radiations of the materials being processed. If the case demands, either dry or wet collectors may be used to remove the toxic constituents in the air, sufficient ventilation being always maintained in the plant buildings. S. Hu

Gas Filters

Berly, E. M., First, M. W., and Silverman, L. RECOVERY OF SOLUBLE GAS AND AEROSOLS FROM AIR STREAMS. *Ind. Eng. Chem.*, **46**, 1769-1777 (1954) September.

In the removal of soluble gases, mists, fumes, and inert particles from stack gases or air, high collection efficiencies are obtained by a combination of a wet coarse fiber bed followed by a dry fiber filter. The fibrous materials investigated include saran, glass, polystyrene, and dynel, ranging from 1 to 178 microns in fiber diameter. For the same volume, this type of packing material weighs only 1/150 to 1/75 as much as the conventional Raschig rings and Berl saddles, while the collection efficiency is from 5 to 10 times higher than the latter packings. Resistance of the wet and dry beds to air flow is proportional to the flow rate of air, and collection efficiency increases with the liquid rate passing through the wet bed. S. Hu

Heat and Mass Transfer

Satterfield, C. N., Resnick, H., and Wentworth, R. L. SIMULTANEOUS HEAT AND MASS TRANSFER IN A DIFFUSION-CONTROLLED CHEMICAL REACTION. PART I STUDIES IN A TUBULAR REACTOR. *Chem. Eng.* Progress. **50**, 460-466. (1954) September.

The rates of heat and mass transfer which occur simultaneously in a solid-gas reaction have been measured for the first time in a diffusion-controlled chemical reaction having sufficiently simple kinetics that the results may be quantitatively compared with the theory and the experimental correlations developed from the reacting systems. The results are analyzed with equations which were developed to predict the relationship between the length of a tubular reactor and the degree of heterogeneous reaction of a gas flowing through it. The reaction studied was the heterogeneous decomposition of vapor mixtures of hydrogen peroxide and water. The observed mass transfer rates are correlated with an average deviation of 9.5% by the equation: $i_D = 0.021 (N_{Re'})^{-0.2}$. The heat transfer results are correlated with an average deviation of 13.7%. The maximum temperature which a surface may reach in a diffusion-controlled chemical reaction is also considered. Authors' Abstract

Heat Exchangers

Wert, O. B. SHELL AND TUBE CONDENSERS FOR USE IN A REFRIGERATING SYSTEM. *Heating and Ventilating*, **51**, 100-106 (1954) October.

A group of graphs and design data are presented to simplify the selection of a shell and tube condenser to remove heat from a refrigerant gas. Author's Abstract

Mixing Solids

Work, L. T. DRY MIXING OF SOLIDS. *Chem. Eng. Progress*, **50**, 476-79 (1954) September.

Batch and continuous mixers and other types of mixing devices are described and illustrated. A discussion is presented of system mixing, also of the several factors which have an important bearing in meeting minimum requirements, for any one mixing problem, i.e., particle size, shape and density. D. J. Dennison

Oxygen Separation

Allen, L. N., Jr. PROCESS AND APPARATUS FOR THE SEPARATION OF OXYGEN FROM AIR. (Assigned to Chemical Construction Corp.) U. S. 2,688,854 (1954) September 14.

This is an intermittent process for obtaining oxygen-enriched air whereby the air is first cooled to condense a film of liquid of relatively higher oxygen content on a heat exchange surface, then removing the uncondensed air and evaporating the condensed film.

C. G. von Fredersdorff

Schilling, Clarence J. (assigned to Air Products, Inc.) GAS SEPARATION. U. S. 2,688,-238 (1954) September 7.

A modification of conventional air separation equipment is proposed wherein dangerous accumulations of explosive hydrocarbons in the liquid oxygen reboiler section are avoided by withdrawing a liquid sidestream through an auxiliary fractionator. This fractionator transfers the explosive impurities to the argon and nitrogen stream and simultaneously yields a high purity oxygen suitable for welding purposes. C. G. von Fredersdorff

Pumps

Litzenger, D. P. and White, H. T. DESIGN AND DEVELOPMENT OF SEAL-LESS PUMPS. *Chem. Eng. Progress*, **50**, 436-44 (1954) September.

The author discusses the basic design, development, and the many applications of seal-less pumps. S. Volchko

Reaction Kinetics

Corrigan, T. E. CHEMICAL ENGINEERING FUNDAMENTALS—II. KINETICS OF HOMOGENEOUS REACTIONS. **61**, 210, 212, 214, 216, 218 (1954) September.

Mathematical solutions using the method of integration and the method of finite differences applied to homogeneous kinetics are reviewed. Reversible, consecutive and side reactions, as well as more complex systems are considered. C. G. von Fredersdorff

Statistical Techniques

Daniel, C. and Riblett, E. W. A MULTIFACTOR EXPERIMENT. *Ind. Eng. Chem.*, **46**, 1465-68 (1954) July.

The use of experiments varying many of the factors involved in each test, instead of the usual one factor per test, results in obtaining data with fewer tests and with interaction between factors having been determined. The outline of multifactor experimentation is presented, as well as the method by which testing procedures are established and test results analyzed. The power of multiple balance in experimental design is illustrated by an experiment of 32 runs on effects of eight preparation variables on performance of catalysts. Each conclusion was as precise as if all 32 runs had been devoted to testing that conclusion alone. B. E. Eakin

Proschan, F. and Babcock, A. R. Jr. HOW TO USE SHORT-CUT STATISTICS. *Chem. Eng.*, **61**, 193-97 (1954) September.

This article discusses some rapid statistical analysis techniques that will help answer two of the most important questions in the field. The first concerns the reliability of an average value, how close it is to the true value, and how much error is permissible. The second concerns the validity of observed differences, whether they really exist, or whether these are merely chance fluctuations. Tables of confidence intervals and critical departure values are given to speed calculations. E. B. Shultz

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Automatic Computation

Dudenbostel, B. F., Jr. and Priestley, W., Jr. AUTOMATIC MASS SPECTROMETRIC ANALYSIS. *Anal. Chem.*, **26**, 1275-78 (1954) August.

Rapid mass spectrometers analyses can be performed utilizing automatic peak selection and digital measurement with subsequent calculation by a high speed digital computer. With this system it is possible to report 30 gas analyses per 8 hour shift. Only 1½ men (11 man hours) per shift are required with this system compared to 40 to 60 man hours for a similar amount of work when using conventional peak measurement and calculation steps. D. V. Kniebes

Office of Naval Research. A SURVEY OF AUTOMATIC DIGITAL COMPUTERS. PB 11293 (1954) October.

Data current to February, 1953 is presented on nearly one hundred automatic digital computers intended for more or less general use. The location of each machine is listed, its availability commercially, the operations it can perform, the speed of operations, the type of storage, and the storage available for computations. At the end of the tabulation are three indexes: 1) listing the computer by name, 2) listing the builders, and 3) giving the geographic location of both the builders, and the computers. B. E. Eakin

Office of Naval Research. SYMPOSIUM ON COMMERCIALLY AVAILABLE GENERAL-PURPOSE ELECTRONIC DIGITAL COMPUTERS OF MODERATE PRICE. PB-111043 (1952) May 14.

Until recently, all commercially available general-purpose automatic digital computers were very large and costly. Within the past year a number of manufacturers have placed on the market smaller, more compact, automatic com-

puters for sale at less than $100,000. With this drastic reduction in cost it has become possible for agencies with moderate budgets to consider purchase of such equipment. This paper contains manufacturer's reports on the operation and uses of seven of the newer low priced computers, permitting interested companies to evaluate the available equipment to determine which, if any, can best satisfy their scientific-computing or data-handling needs. The computers covered are: JAINCOMP-B-1, MONROBOT, CADAC, CIRCLE COMPUTER, ELECOM 100, MODEL 30-201 CEC, and MINIAC. The best features of each are explained, as well as the uses for which each is best fitted. B. E. Eakin

Sackett, W. T., Jr. THE ANALOG COMPUTER IN ENGINEERING. *Battelle Techn. Rev.*, 93 (1954) September.

The analog computer is an electronic model of a physical system, such as a suspension system for a car or truck. The analog allows variations in design to be tried with a minimum of expense and time, the system frequently existing only on the drawing boards. Analogs are used for calculating oil recoveries, diffusion, research in non-linear mechanics, developing electronic component design, simulating nuclear reactors and flight trainers, suspension system design, and structural analysis, to list a few of the more common ones. Advances toward automation in many industries assure the future of the analog computer. Its adaptability will make it a key component, along with the digital computers, in the design and operation of automatic factories. B. E. Eakin

Williams, F. K., and Klein, M. L. SURVEY OF INTEGRATED DATA CONVERSION SYSTEMS. *Instruments and Automation*, 27, 1460-62 (1954) September.

This survey presents some of the newest concepts in the handling of data. Storage in analog form followed by analog-to-digital conversion, with storage being in digital form. The philosophies on data handling are outlined. The theory of multiplexing, and application of the information theory to data sampling, are briefly discussed. B. E. Eakin

Combustibles Detector

Müller, R. H. A SUPERSENSITIVE GAS DETECTOR PERMITS ACCURATE DETECTION OF TOXIC OR COMBUSTIBLE GASES IN EXTREMELY LOW CONCENTRATIONS. *Anal. Chem.*, 26, 39A-40A, 42A (1954) September.

A supersensitive detector of oxidizable gases are described in this article. The gases are filtered to take out the undesirable components, and oxidized by red mercuric oxide. The latter is reduced to detectable Hg vapor at 2537 A which is picked up by a photocell and recorded. CO as low as one part in a billion is claimed to be detectable. S. Mori

Humidity Instruments

Case, J. W. NEW MOISTURE-SENSITIVE ELEMENT FOR RELATIVE HUMIDITY. *Instr. and Autom.*, 27, 1076-77 (1954) July.

The use of wood shavings as moisture sensitive elements is described. Results of performance tests on convolute-type and spiral-type wound cylinders are compared with results of tests employing hair elements. The new type elements show promise of eliminating some of the shortcoming of the human-hair elements used previously. R. Parker

Gravity Gage

Brunton, D. C. and Pepper, T. P. GRAVITY MEASUREMENT ON PRODUCTS LINE. *Oil Gas J.*, 53, 79-81 (1954) August 30.

The Density Gammagage of Isotope Products, Ltd., has been successfully applied to the direct and continuous measurement of product gravity by radiation methods on a products pipeline of Trans Northern Pipe Line Co. The instrument will fit on lines from 3 to 31 inches diameter and shows a linear relationship between instrument reading and product gravity. By use of an expanded gravity scale it is possible for the operator to detect changes of a few points API in gravity. The gage is simple in principle, easy to operate, and requires a minimum of maintenance, with installation of both source and detector being exterior to the pipe. No sampling or by-pass lines are required. B. E. Eakin

12. MATERIALS OF CONSTRUCTION

Inhibitors

Mayne, J. E. and Van Rooyen, D. THE MECHANISM OF THE CORROSION-INHIBITIVE ACTION OF PAINTS, WITH SPECIAL REFERENCE TO BASIC PIGMENTS. *J. Appl. Chem.*, (British), 4, 384-94 (1954) July.

Some paints can prevent corrosion by modifying the anodic reaction; for this to occur the pigment must be either metallic, water soluble or basic. This article is concerned with the way in which basic pigments suppress corrosion.

S. Volchko

Painting

Stanners, J. F. PAINTING FOR THE PROTECTION OF OUTDOOR METAL STRUCTURES. PART II. THE PAINT AND ITS APPLICATION. *Corrosion Techn.*, 1, 239-42 (1954) September.

The author discusses in this concluding article the choice of paints, paint formulation, the paint system, and, when and how to paint.

S. Volchko

Plastic Tanks

Gibbon, A. CORROSION-RESISTANT PLASTIC TANKS HAVE GREAT STRENGTH. *Pipe Line Industry*. 1, 78-79. (1954) September.

This article reveals the advantages of tanks made from synthetic resin which is reinforced by glass, possessing a tensile strength of 72,000 psi and resisting the corrosive action of H_2S as well as most acids.

S. Volchko

Structural Carbon

Ruhl, F. F. ENGINEERING APPLICATIONS OF CARBON-GRAPHITE. *Ind. Heating*, 21, 1405-06, 1408, 1410, 1412 (1954) July.

A dissertation on the manufacture and utilization of carbon-graphite as a solution to engineering problems that involve high temperature, high pressure, high speed parts and materials, and where clean gases and liquids are essential.

A. J. Tulis

Well Corrosion

Shock, D. A. and Sudbury, J. D. CORROSION CONTROL IN GAS LIFT WELLS: II EVALUATION OF INHIBITORS. *Corrosion*, 10, 289-294 (1954) September.

Conditions in gas lift wells producing appreciable proportions of water are reviewed. Principal corrodent is reported to be carbon dioxide and certain peculiarities of gas-lift wells are enumerated. Because of the importance of the ionic composition and chemical content of produced waters, especially those of Gulf Coast wells, the scaling problem associated with these wells is an important consideration in devising inhibitive practices. Because a current statistical analysis indicates about 4000 Gulf Coast gas-lift wells probably are already corrosive and because it is expected that 16,000 ultimately will be corrosive the authors point out a potential corrosion damage of as much as $16,000,000 annually. Chemicals used to inhibit corrosion in these wells must have the faculty of penetrating the column of oil and water standing in the well. Laboratory experiments using a model gas-lift well and actual produced fluids are described. Some currently available inhibitors have the disadvantage of forming insoluble salts with the calcium and magnesium ions and thus their use is precluded. Furthermore these compounds have not proved stable at reservoir temperatures. Arsenical inhibitors consisting of solutions of sodium arsenite and sodium polyphosphate which proved in tests to be an adequate inhibitors, subsequently were the cause of such difficulties; their use was abandoned generally. Continued tests in two wells indicated they could be used when properly diluted if treatment was continuous and batch fed. Arsenic precipitation was seen as a possible bad effect but reversion of polyphosphates was not encountered. Further there was some suspicion arsenic from these inhibitors resulted in the poisoning of the catalyst in a catalytic cracker. Subsequently it was learned the standard electrical desalting process effectively removes the arsenic. Investigations of organic polar compounds weighted with ethylene glycol resulted in the Continental Oil Company developing its own inhibitors. One of these is being tested in a 7600-foot well.

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